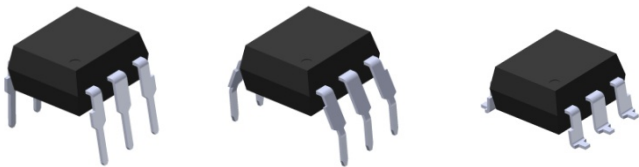
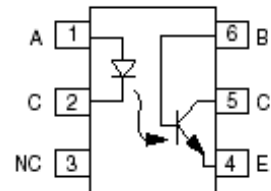


### 6 PIN DIP PHOTOTRANSISTOR PHOTOCOUPLER TIL11X Series MCT2X Series



Schematic



Pin Configuration

1. Anode
2. Cathode
3. No Connection
4. Emitter
5. Collector
6. Base

#### Features:

- TIL11X series: TIL111, TIL117
- MCT2X series: MCT2, MCT2E
- High isolation voltage between input and output  
Viso = 5000 Vrms
- Creepage distance >7.6mm
- Compact dual-in-line package
- Operating temperature up to +110°C
- Pb free and RoHS compliant.
- UL approved (No. E214129)
- VDE approved (No. 132249)
- SEMKO approval
- NEMKO approved
- DEMKO approved
- FIMKO approved
- CSA approved
- CQC approved

#### Description

The TIL11X series and MCT2X series of devices each consist of an infrared emitting diode optically coupled to a phototransistor detector. They are packaged in a 6-pin DIP package and available in wide-lead spacing and SMD option.

#### Applications

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs
- Appliance system
- Industrial controls

**Absolute Maximum Ratings (Ta=25°C)**

	Parameter	Symbol	Rating	Unit
Input	Forward current	$I_F$	60	mA
	Peak forward current (t = 10μs)	$I_{FM}$	1	A
	Reverse voltage	$V_R$	6	V
	Power dissipation	$P_D$	100	mW
	Derating factor (above 100°C)		3.8	mW/°C
Output	Collector-Emitter voltage	$V_{CEO}$	80	V
	Collector-Base voltage	$V_{CBO}$	80	V
	Emitter-Collector voltage	$V_{ECO}$	7	V
	Power dissipation	$P_C$	150	mW
	Derating factor (above 100°C)		9.0	mW/°C
	Total Power Dissipation	$P_{TOT}$	200	mW
	Isolation Voltage*1	$V_{ISO}$	5000	V rms
	Operating Temperature	$T_{OPR}$	-55 to 110	°C
	Storage Temperature	$T_{STG}$	-55 to 125	°C
	Soldering Temperature*2	$T_{SOL}$	260	°C

Notes:

\*1 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2 & 3 are shorted together, and pins 4, 5 & 6 are shorted together.

\*2 For 10 seconds

**Electro-Optical Characteristics (Ta=25°C unless specified otherwise)**

**Input**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward voltage	TIL111	-	1.22	1.4	V	$I_F = 16\text{mA}$
	TIL117	-	-	1.4		$T_A = 0\text{-}70^\circ\text{C}$ , $I_F = 16\text{mA}$
		-	1.32	-		$T_A = -55^\circ\text{C}$ , $I_F = 16\text{mA}$
	MCT2 MCT2E	-	1.1	-		$T_A = 110^\circ\text{C}$ , $I_F = 16\text{mA}$
Reverse current	$I_R$	-	-	10	$\mu\text{A}$	$V_R = 6\text{V}$

**Output**

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
Collector-Base dark current	$I_{CBO}$	-	-	20	nA	$V_{CB} = 10\text{V}$
Collector-Emitter dark current	All	-	1	50	nA	$V_{CE} = 10\text{V}$ , $I_F = 0\text{mA}$
	TIL117	-	0.2	50		$V_{CE} = 30\text{V}$ , $I_F = 0\text{mA}$ , $T_A = 70^\circ\text{C}$
Collector-Emitter breakdown voltage	$BV_{CEO}$	80	-	-	V	$I_C = 1\text{mA}$
Collector-Base breakdown voltage	$BV_{CBO}$	80	-	-	V	$I_C = 0.01\text{mA}$
Emitter-Collector breakdown voltage	$BV_{ECO}$	7	-	-	V	$I_E = 0.1\text{mA}$
Emitter-Base breakdown voltage	$BV_{EBO}$	7	-	-	V	$I_E = 0.1\text{mA}$

\* Typical values at  $T_a = 25^\circ\text{C}$

**Transfer Characteristics**

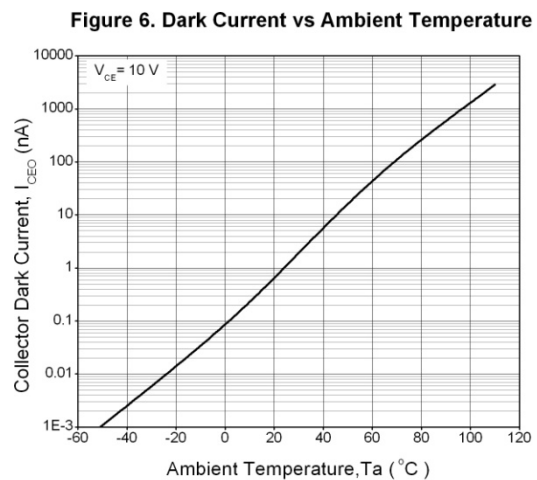
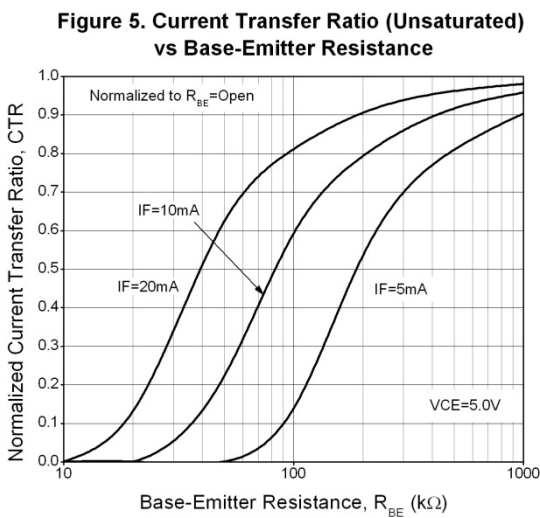
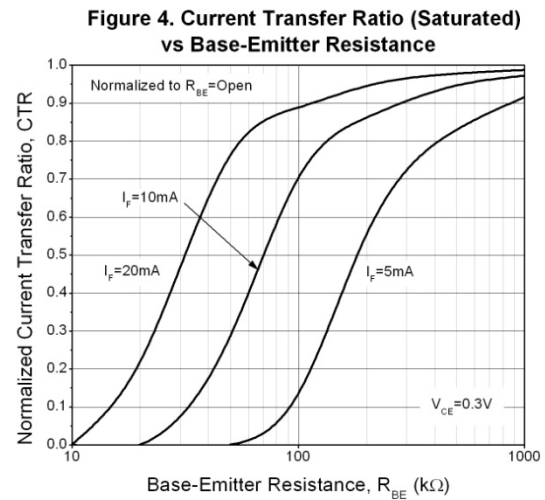
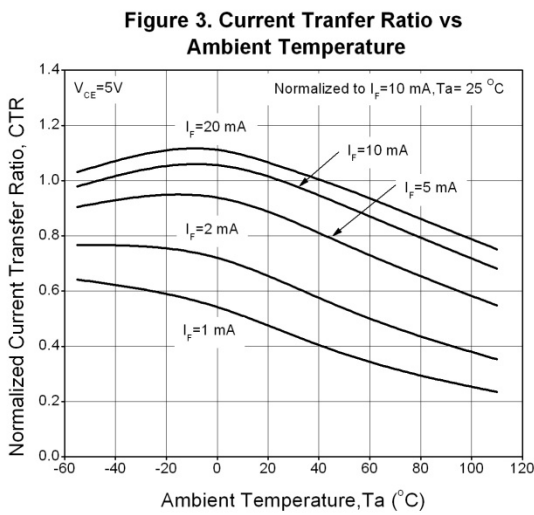
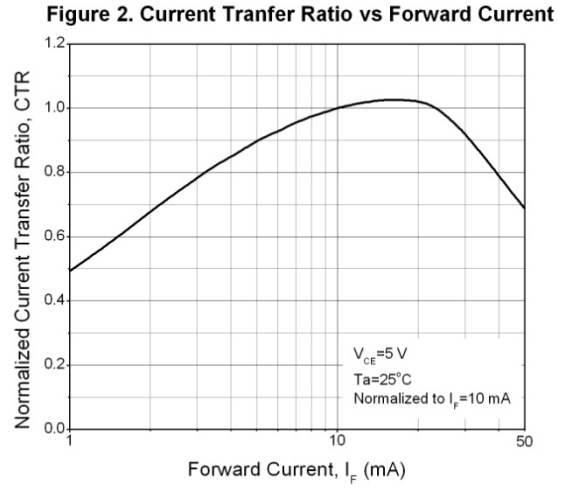
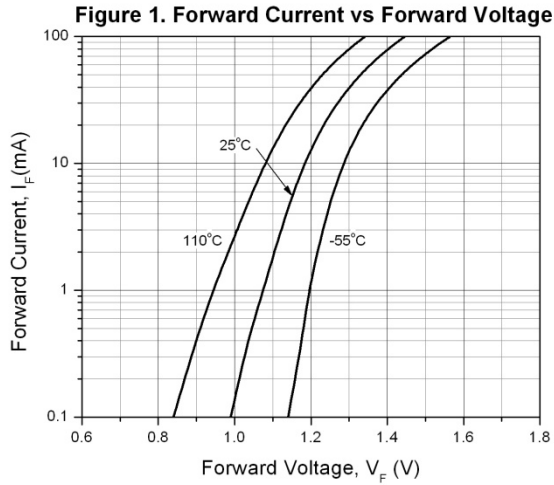
Parameter	Symbol	Min	Typ.	Max.	Unit	Condition	
Collector current (Phototransistor operation)	TIL111	$I_{C(ON)}$	2	-	-	mA	$I_F = 16\text{mA}$ , $V_{CE} = 0.4\text{V}$
Collector current (Photodiode operation)			7	-	-	$\mu\text{A}$	$I_F = 16\text{mA}$ , $V_{CB} = 0.4\text{V}$
Current Transfer Ratio	TIL117	CTR	50	-	-	%	$I_F = 10\text{mA}$ , $V_{CE} = 10\text{V}$
	MCT2 MCT2E		20	-	-		$I_F = 10\text{mA}$ , $V_{CE} = 10\text{V}$

## Transfer Characteristics

Parameter		Symbol	Min	Typ.	Max.	Unit	Condition
Collector-Emitter saturation voltage	All	$V_{CE(sat)}$	-	-	0.4	V	$I_F = 16mA, I_C = 2mA$
	TIL117		-	-	0.4		$I_F = 10mA, I_C = 0.5mA$
Isolation resistance		$R_{IO}$	$10^{11}$	-	-	$\Omega$	$V_{IO} = 500Vdc$
Input-output capacitance		$C_{IO}$	-	-	2	pF	$V_{IO} = 0, f = 1MHz$
Turn-on time	TIL117	$T_{on}$	-	10	12	$\mu s$	$V_{CC} = 10V,$ $I_C = 2mA, R_L = 100\Omega$
Turn-off time	TIL117	$T_{off}$	-	9	12		
Rise time	TIL117 TIL111	$t_r$	-	6	10		
Fall time	TIL117 TIL111	$t_f$	-	8	10		
Turn-on time	MCT2 MCT2E	$T_{on}$	-	3	10	$\mu s$	$V_{CC} = 10V,$ $I_F = 10mA, R_L = 100\Omega$
Turn-off time	MCT2 MCT2E	$T_{off}$	-	3	10		
Rise time	MCT2 MCT2E	$t_r$	-	3	10		
Fall time	MCT2 MCT2E	$t_f$	-	3	10		

\* Typical values at  $T_a = 25^\circ C$

Typical Electro-Optical Characteristics Curves



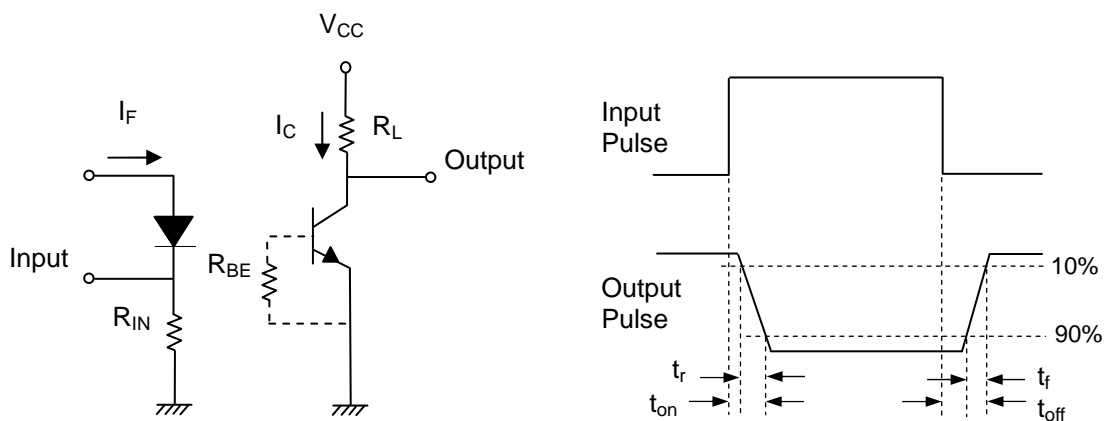
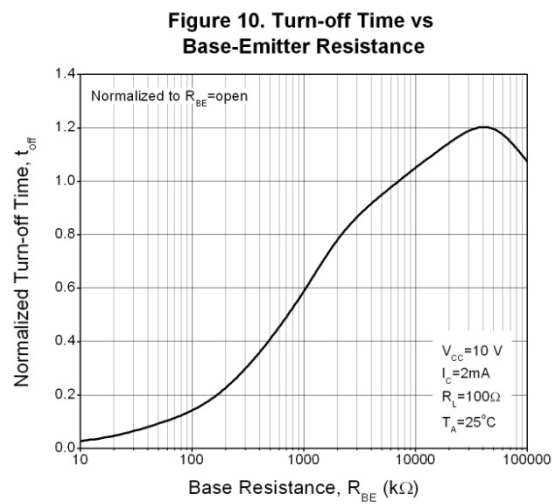
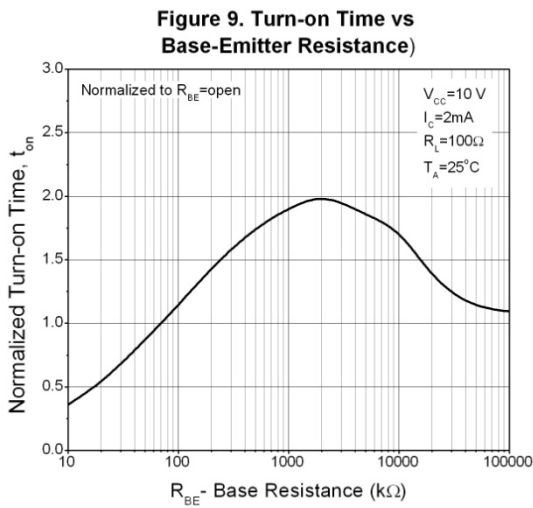
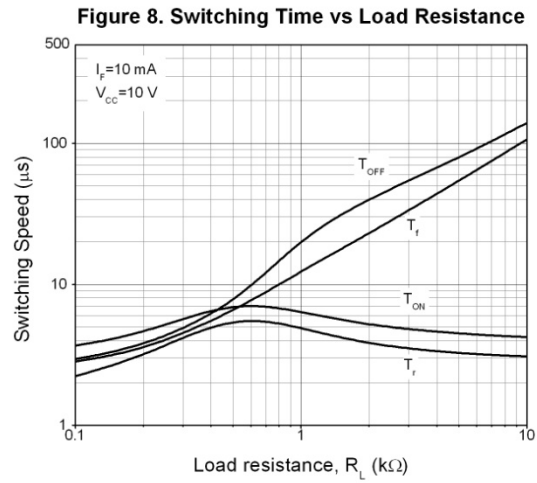
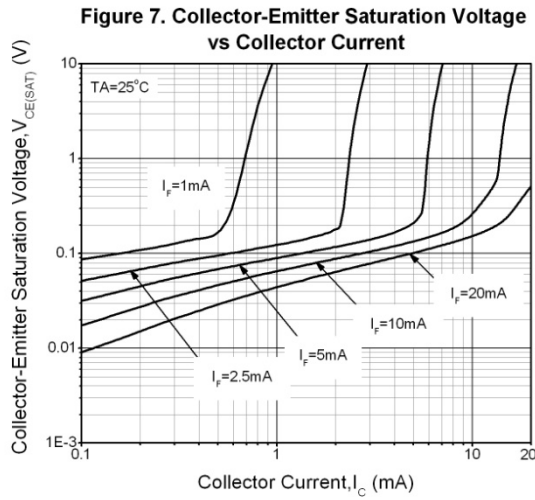


Figure 11. Switching Time Test Circuit & Waveforms

## Order Information

### Part Number

**TIL11XY(Z)-V**

or

**MCT2XY(Z)-V**

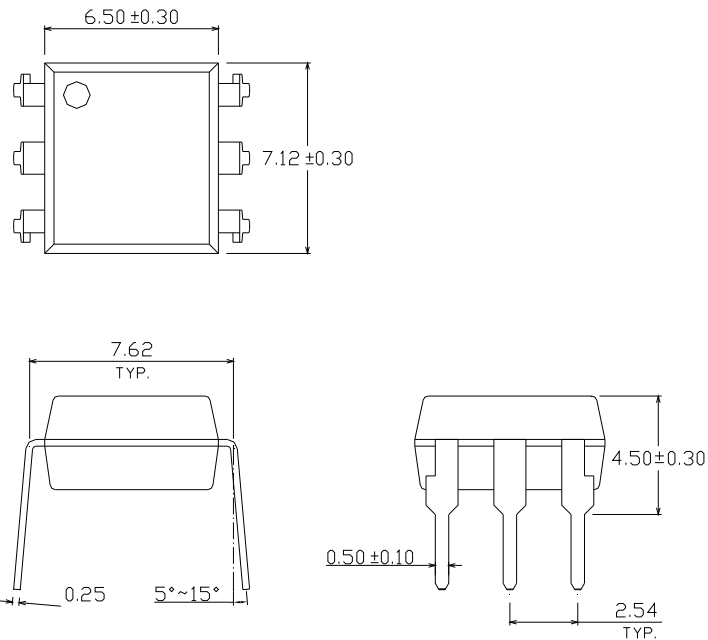
### Note

- X = Part no. for MCT2X series (E or none)  
= Part no. for TIL11X series (1 or 7)
- Y = Lead form option (S, S1, M or none)
- Z = Tape and reel option (TA, TB or none).
- V = VDE safety (optional)

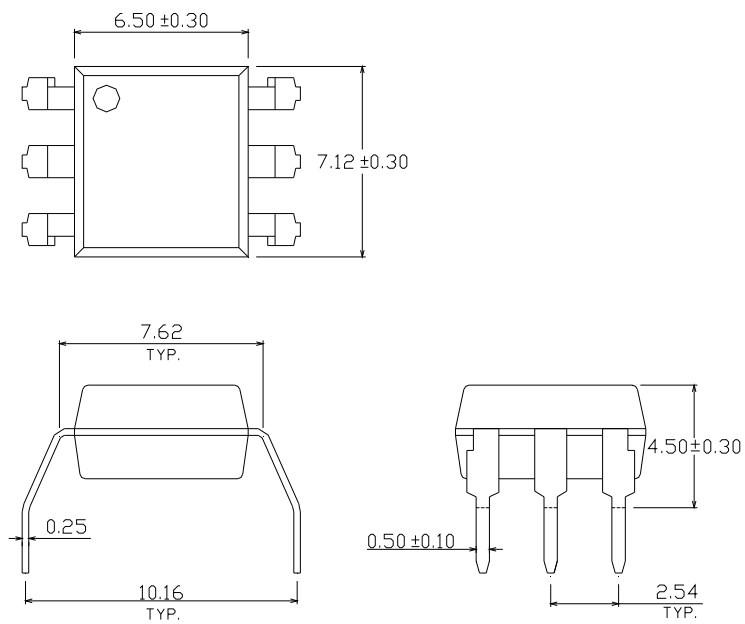
Option	Description	Packing quantity
None	Standard DIP-6	65 units per tube
M	Wide lead bend (0.4 inch spacing)	65 units per tube
S (TA)	Surface mount lead form + TA tape & reel option	1000 units per reel
S (TB)	Surface mount lead form + TB tape & reel option	1000 units per reel
S1 (TA)	Surface mount lead form (low profile) + TA tape & reel option	1000 units per reel
S1 (TB)	Surface mount lead form (low profile) + TB tape & reel option	1000 units per reel

Package Dimension (Dimensions in mm)

Standard DIP Type

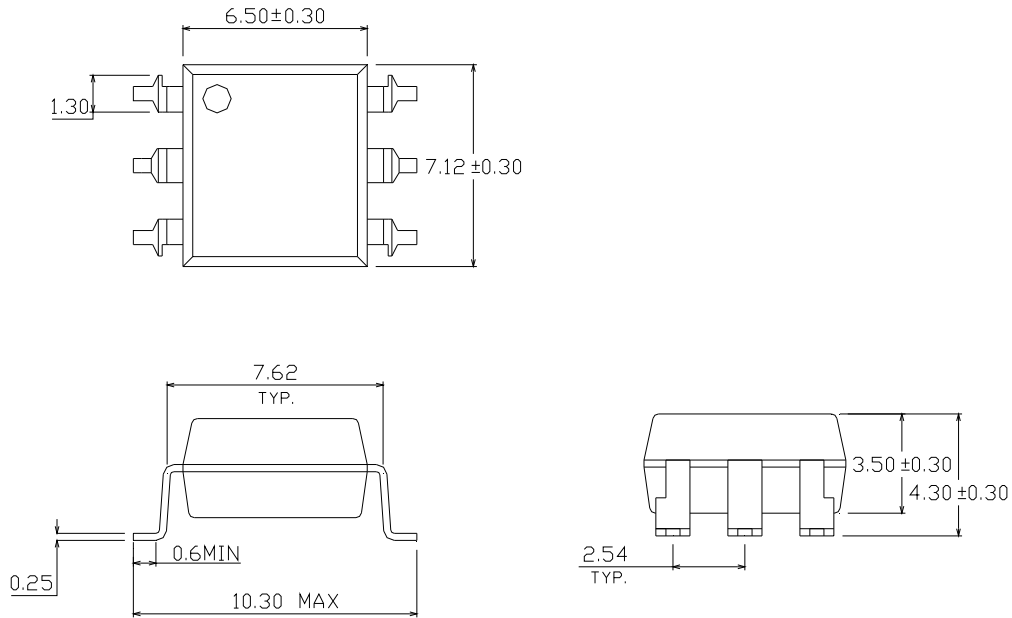


Option M Type

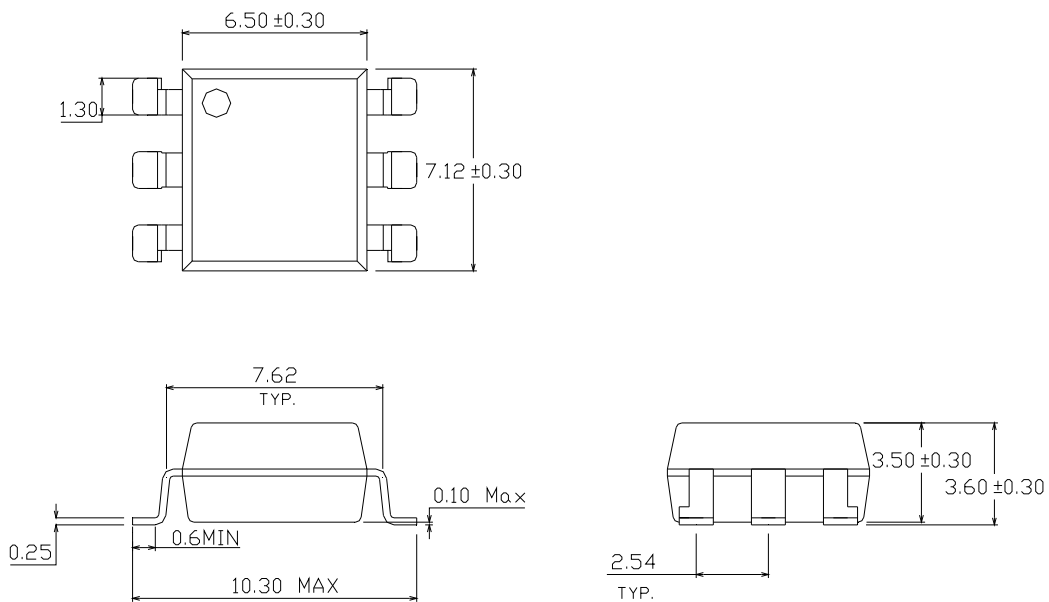




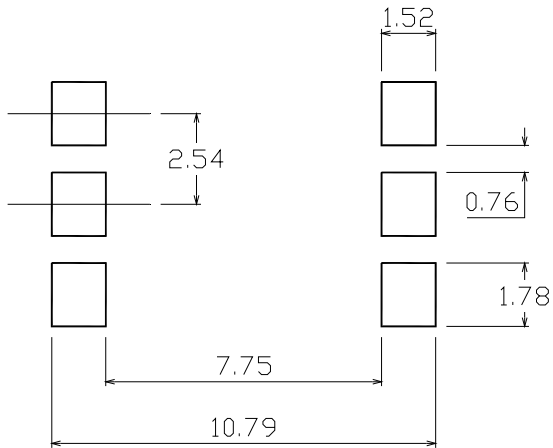
Option S Type



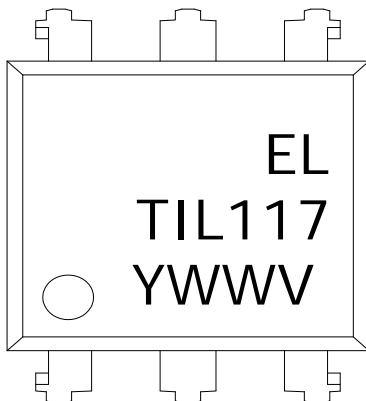
Option S1 Type



### Recommended pad layout for surface mount leadform



### Device Marking

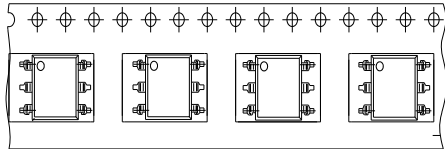


### Notes

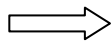
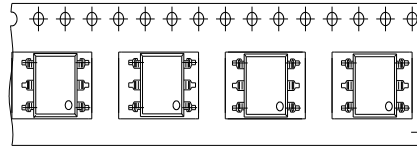
- EL denotes Everlight
- TIL117 denotes Device Number
- Y denotes 1 digit Year code
- WW denotes 2 digit Week code
- V denotes VDE optional

**Tape & Reel Packing Specifications**

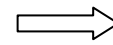
**Option TA**



**Option TB**

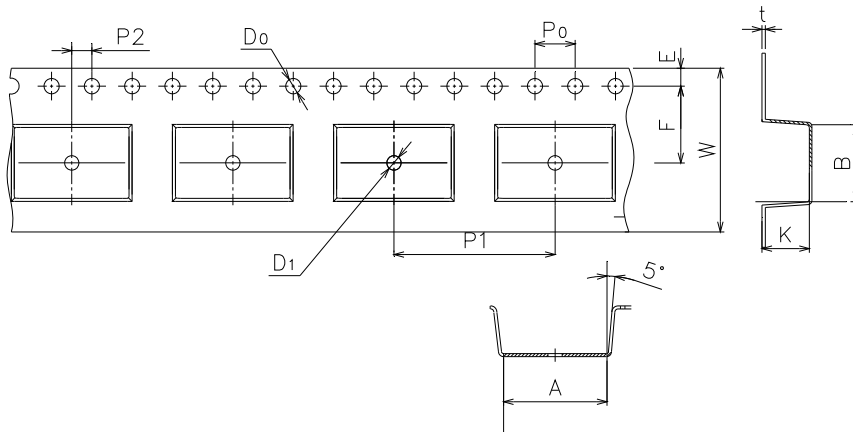


Direction of feed from reel



Direction of feed from reel

**Tape dimensions**

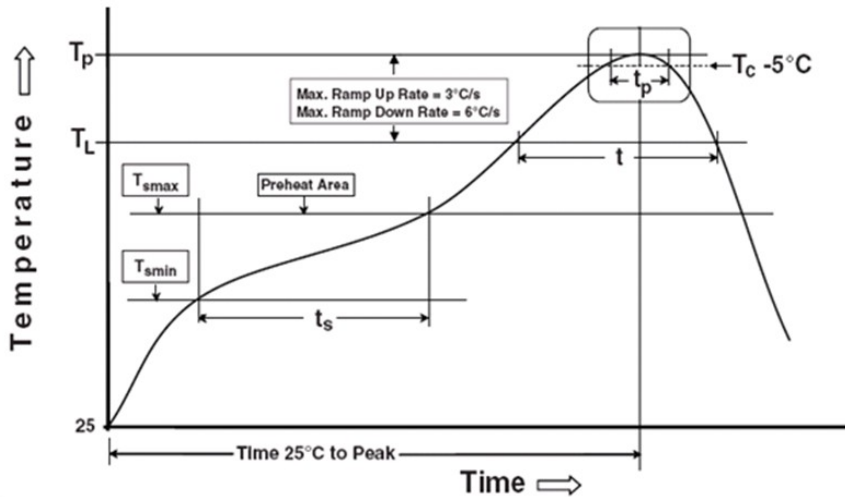


Dimension No.	<b>A</b>	<b>B</b>	<b>Do</b>	<b>D1</b>	<b>E</b>	<b>F</b>
Dimension (mm)	10.4±0.1	7.5±0.1	1.5±0.1	1.5+0.1/-0	1.75±0.1	7.5±0.1
Dimension No.	<b>Po</b>	<b>P1</b>	<b>P2</b>	<b>t</b>	<b>W</b>	<b>K</b>
Dimension (mm)	4.0±0.15	12±0.1	2.0±0.1	0.35±0.03	16.0±0.2	4.5±0.1

## Precautions for Use

### 1. Soldering Condition

#### 1.1 (A) Maximum Body Case Temperature Profile for evaluation of Reflow Profile



Note:

Reference: IPC/JEDEC J-STD-020D

#### Preheat

Temperature min ( $T_{smin}$ )	150 °C
Temperature max ( $T_{smax}$ )	200°C
Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )	60-120 seconds
Average ramp-up rate ( $T_{smax}$ to $T_p$ )	3 °C/second max

#### Other

Liquidus Temperature ( $T_L$ )	217 °C
Time above Liquidus Temperature ( $t_L$ )	60-100 sec
Peak Temperature ( $T_p$ )	260°C
Time within 5 °C of Actual Peak Temperature: $T_p - 5^\circ\text{C}$	30 s
Ramp- Down Rate from Peak Temperature	6°C /second max.
Time 25°C to peak temperature	8 minutes max.
Reflow times	3 times

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